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### REMARKS

Claims 40-48, 50, 57-63, 65, 66 and 70 are pending herein.

1. Claims 40-42, 44-52 and 53 were rejected under §102(b) over Sonntag. This rejection is respectfully traversed for the following reasons.

Claim 40 recites a ceramic component that includes a ceramic body comprising silicon carbide and an oxide layer. The oxide layer contains an amorphous matrix phase comprising silica and a crystalline phase provided in the amorphous matrix phase. The crystalline phase comprises anisotropically-shaped crystals including at least one of alumina and an aluminosilicate.

Sonntag discloses a silicon carbide body having an overlying oxide layer. However, as properly acknowledged by the PTO on page 6, columns 16-17, Sonntag fails to disclose anisotropically-shaped crystals provided in the oxide layer. Accordingly, in light of the amendments to claim 40, the §102 rejection over Sonntag is moot, and withdrawal of the rejection is respectfully requested.

2. Claims 43 and 65-67 were rejected under §103 over Sonntag in view of Dussaulx et al. Apparently, the PTO has relied upon Dussaulx et al. for disclosure of particular compositional features of the base ceramic body. However, Dussaulx et al. fail to address the deficiencies of Sonntag noted above. Accordingly, withdrawal of the §103 rejection over Sonntag in view of Dussaulx et al. is respectfully requested.

3. Claims 54-60 and 63-64 were rejected under §103 over Sonntag in view of Hida. Although independent claims 54 and 64 have been canceled herein, to the extent that this rejection is applied against the currently pending claims, it is respectfully traversed for the following reasons.

As stated above, the claimed invention is drawn to a ceramic component that includes a ceramic body comprising silicon carbide and an oxide layer. The oxide layer is a multiphase layer including an amorphous matrix phase and a crystalline phase provided in the amorphous

matrix phase. In addition, the crystalline phase is comprised of anisotropically-shaped crystals composed of at least one of alumina and an aluminosilicate.

The claimed invention was developed to address deficiencies of prior art ceramic bodies containing oxide layers, including state-of-the-art components that include an amorphous (glassy) silica-based oxide layer or conventional crystalline oxide layers. The claimed component may be manufactured through a process in which fine alumina is coated on the ceramic component, followed by oxidation in a manner to form the characteristic multi-phase material including an amorphous matrix phase and a crystalline phase provided therein. Applicant has discovered that the claimed ceramic component offers desirable oxidation resistance even in demanding deployments such as exposure to heat cycling in refractory applications.

Sonntag recognizes that conventional amorphous oxide layers are insufficient to adequately protect the underlying silicon carbide-based ceramic from oxidation. See column 2, lines 8-35, for example. In this respect, Sonntag recognizes that such amorphous layers have a notable mismatch in thermal expansion coefficients with the underlying silicon carbide ceramic. Such a mismatch causes breakdown of the oxide layer and exposure of silicon carbide to the environment of the refractory furnace. In an attempt to address the deficiencies of such prior art systems, Sonntag teaches a process in which an alumina precursor ( $\text{AlOOH}$ ) in the form of a colloidal suspension is loaded into the ceramic by sol-gel infiltration. Sol-gel infiltration is carried out multiple times in order to ensure a high loading of the  $\text{AlOOH}$  material onto the silicon carbide ceramic (see column 3, lines 18-21). Oxidation is carried out to react the silicon carbide body with the sol-gel coating, to form a "crystalline or part-crystalline" anti-oxidation layer, which has a thermal expansion property that is matched with the underlying silicon carbide ceramic (unlike prior art amorphous layers).

Although Sonntag mentions "part-crystalline," a detailed reading of Sonntag reveals that the objective is to form an overlying oxide layer that is principally, if not entirely, formed of a crystalline material, notably in the form of mullite or zircon (see column 3, line 49; column 4, lines 28-30, lines 36-37, line 46 and lines 58-68). Of notable significance, Sonntag discloses that the sol-gel processing route enables formation of high concentrations of  $\text{AlOOH}$  on the surface

of the silicon carbide ceramic, thereby enabling the formation of a crystalline protective layer, rather than an amorphous protective layer, the crystalline protective layer being in the form of mullite (alternatively zircon). The crystalline mullite is described as having a closely matched thermal expansion coefficient with the underlying silicon carbide ceramic. See also column 5, first paragraph.

In summary, it is quite clear that Sonntag recognizes similar deficiencies with the state-of-the-art amorphous-based coating technologies, and addresses this deficiency by forming a coating that is desirably entirely crystalline, to impart the coating with a matched thermal expansion coefficient associated with the underlying silicon carbide. In direct contrast to Sonntag, the claimed invention calls for an amorphous matrix phase, in which the crystalline phase is embedded. This is contrary to the teachings of Sonntag, which focus on high loadings of AlOOH to produce a crystalline layer having a desired thermal expansion coefficient. Applicant submits that even if Sonntag were broadly read to teach structures having some amorphous content, clearly Sonntag does not teach or even remotely suggest incorporating sufficient amorphous content to provide an amorphous matrix phase. At best, Sonntag teaches that perhaps isolated regions of an amorphous phase may be left behind subsequent to heat treatment. However, clearly an amorphous matrix is not disclosed or even remotely suggested, and is believed to be precisely contrary to the teachings of Sonntag.

Still further, the claimed invention calls for the crystalline phase provided in the amorphous matrix to be comprised of anisotropically-shaped crystals. Without wishing to be tied to any particular theory, it is believed that the characteristic anisotropically-shaped crystals are a result of the particular process flow described in the present specification, notably which relies upon alumina ( $\text{Al}_2\text{O}_3$ ) having a fine particle size being coated on the silicon carbide ceramic body. The characteristic anisotropically-shaped crystals are notably important to the claimed invention, and are at least partly responsible for the improved oxidation characteristics associated with the claimed invention. Although the PTO has relied upon Hida for alleged suggestion of utilization of anisotropically-shaped crystals, Hida is merely drawn to a composite that includes silicon carbide whiskers combined with alpha alumina. Any feasible reliance upon Hida would certainly not result in needle-shaped crystals comprised of alumina or an

aluminosilicate, since description of whiskers is provided in the context of silicon carbide, not alumina or aluminosilicate.

For at least the foregoing reasons, Applicant respectfully submits that the presently claimed invention would not have been obvious over Sonntag in view of Hida. Accordingly, withdrawal of the §103 rejection over these references is respectfully requested.

4. Claims 61-62 were rejected over Sonntag in view of Hida and Hillig. In addition, claim 60-70 were rejected over Sonntag in view of Hillig. Applicant submits that Hillig fails to cure the deficiencies of Sonntag discussed above. Accordingly, withdrawal of these rejections is respectfully requested as well.

Applicant respectfully submits that the present application is now in condition for allowance. Accordingly, the Examiner is requested to issue a Notice of Allowance for all pending claims.

Should the Examiner deem that any further action by the Applicant would be desirable for placing this application in even better condition for issue, the Examiner is requested to telephone Applicant's undersigned representative at the number listed below.

Applicant does not believe that any additional fees are due, but if the Commissioner believes additional fees are due, the Commissioner is hereby authorized to charge any fees which may be required, or credit any overpayment, to Deposit Account Number 50-3797.

Respectfully submitted,

Date

12/7/06

  
Jeffrey M. Abel, Reg. No. 36,079

Attorney for Applicant(s)

LARSON NEWMAN ABEL POLANSKY &  
WHITE, LLP

5914 West Courtyard Drive, Suite 200

Austin, Texas 78730

(512) 439-7100 (phone)

(512) 439-7199 (fax)